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Regional distribution of Sonic Hedgehog, patched, and smoothened mRNA in the adult rat brain.

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In vertebrates, Sonic Hedgehog (Shh), Desert Hedgehog (Dhh), and Indian Hedgehog (Ihh) genes encode a family of morphogen proteins that are implicated in a wide range of signaling activities, particularly during embryonic development. These secreted proteins are proposed to mediate their effects on target cells by interacting with their putative receptor, Patched (Ptc), and with a seven-pass transmembrane protein, Smoothened (Smo). However, the roles that these signaling molecules may play in adult tissues, particularly in brain, are not yet clearly defined. Therefore, we investigated the expression of these genes in adult rat tissues. Northern blot analysis revealed expression of Shh, Dhh, and Ihh genes in peripheral tissues, whereas Shh transcript was also identified in brain. It is interesting that northern blot analysis with probes derived from the mouse Ptc and Smo genes revealed the expression of a 7.9-kb and a 3.7-kb transcript, respectively, in all brain tissues examined. In situ hybridization experiments using specific digoxigenin-labeled riboprobes showed expression of Ptc and Smo transcripts in discrete brain areas. Shh-positive cells were observed in restricted regions of the brain. Within the cerebellum, Shh, Ptc, and Smo transcripts were colocalized in the Purkinje cell layer. These data suggest that, besides its roles in determining cell fate and patterning during embryogenesis, the hedgehog signaling pathway may have also important roles in the adult brain.

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